

Thanks for participating in this workshop. I greatly appreciate that you are spending valuable time and financial resources here, but believe the workshop can be valuable to you and your organizations, as well as to NASA.

It's good to see so many old friends and to hopefully have an opportunity to make some new ones. Because the NASA organization seems to change daily, let me introduce myself to everybody. I am currently Team Leader for Environmental Compatibility Assessment in the NASA Headquarters Office of Aeronautics & Space Transportation Technology in Washington, DC. And although my training and most of my professional experience has been in aeronautical engineering, I've spent much of the last nine years overseeing NASA's studies of the atmospheric effects of aviation, primarily a scientific endeavor. That's helped me to begin understanding global climate change and stratospheric ozone depletion issues. Participation in studies of aircraft noise and emissions technology has also provided some knowledge of local environmental concerns as well. But I hope to have a much better understanding of all of the related issues by noon on Thursday.

Because of the great romance with space exploration, some of you may have been surprised to learn that NASA is involved in aeronautical research. The National Advisory Committee for Aeronautics was founded in 1915, just twelve years after the Wright Brothers' first flight. In 1958, NACA's charter was folded into the Space Act, which was the authorizing legislation for the National Aeronautics & Space Administration. The particularly relevant directive is that NASA is to maintain a leadership position for the United States in aeronautical science and technology.

To most people that probably is associated with what has been termed "The right stuff", flying farther, faster and higher. NASA researchers have also been active in ensuring that aeronautical technology is friendly to the environment. For example, the Pratt & Whitney engines, which make the Boeing MD-80 one of the most quiet airplanes, use technology developed in NASA-sponsored programs. And the GE engines, which use the newest low emissions combustors, have also benefited from NASA investments. My NASA colleagues can relate many other examples of how your tax dollars are helping airplanes to be clean and quiet.

But clean and quiet are relative terms, and you may not agree that airplanes are friendly enough to the environment. Even more likely, we all might agree that the phenomenal growth of the aviation industry may threaten its environmental compatibility. The White House Office of Science & Technology Policy expressed concern about this matter in 1995 when it reported that Environmental issues are likely to impose the fundamental limitation on air transportation in the 21st century. Because of this concern, OSTP has recommended that a key national goal be to ensure the long-term environmental compatibility of the aviation system. I'm sure that our key note speaker this morning will have more to say in that regard.

NASA Administrator Dan Goldin, picked up on this theme in his 1997 response, *Aeronautical & Space Transportation Technology: Three Pillars for Success*. Speaking for NASA, he suggested that there are technological solutions that will significantly reduce aircraft emissions that contribute to global warming and ozone depletion, even as travel volume increases. Mr. Goldin also asked if We [can] go further and create aircraft that are so quiet that the predominant noise at airports comes from cars and buses?

To move in this direction, the NASA Aeronautics Enterprise collaborated, particularly with the aeronautical manufacturing industry, to develop stretch goals for both

emissions and noise under the Global Civil Aviation Pillar. These goals are meant to enable the aviation industry to:

- Reduce emissions of future aircraft by a factor of three within 10 years, and by a factor of five within 20 years, and
- Reduce the perceived noise levels of future aircraft by a factor of two from today's subsonic aircraft within 10 years, and by a factor of four within 20 years.

And, as stated in the Three Pillars brochure, which most of you have seen by now, both of these environmental goals have the requirement to be achieved without affecting safety or affordability.

Since the first statement of these goals about a year ago, there have been many questions about their meaning. For example, exactly what emissions are to be reduced at the 10 and 20-year horizons? And exactly what is to be the state of technology development or application at these horizons? I'm sure that you have other questions about these or the other goals associated with the Three Pillars.

The most basic response to these questions is that the goals were originally articulated in a purposely dramatic, although somewhat ambiguous manner, for Administrator Goldin's overarching message, while allowing later development of appropriately more clear definitions for each of the specific enabling technology areas. And after using their collected wisdom to stretch our imaginations, the executives responsible for the Three Pillars then assigned NASA teams to assess the ability of current programs to achieve the various goals and to determine what additional effort may be required (i.e., "gap" analyses).

Members of the NASA Environmental Compatibility Assessment (ECoA) Core Team are:

- NASA Headquarters: Howard Wesoky
- Dryden Flight Research Center: Ron Ray
- Ames Research Center: Chuck Smith, Paul Soderman
- Langley Research Center: Doug Dwoyer, Dave Stephens
- Lewis Research Center: Carol Russo, John Rohde

So we are the NASA employees who are most concerned with your views. Each of us is identified by our badge, and only Carol Russo is not here today. She will join us tomorrow.

As you can see, the ECoA Core Team has taken the important first steps of designing a logo and drafting a vision statement:

In collaboration with carriers, manufacturers, academia and other government agencies, NASA will develop robust technology options with the objective that environmental issues do not constrain the growth of air transportation.

Recognizing the importance of eliminating some of the ambiguity of the goals, we have similarly begun to draft answers to some of the glaring questions previously mentioned. For example, the emissions goal specifically refers to oxides of nitrogen (NO_x), but there are parallel CO₂ considerations in the present NASA programs, which will be the principal source of technology at the 10-year horizon. We are currently evaluating what levels of CO₂ reduction are appropriate for both the 10 and 20-year horizons.

Based on our understanding of technology transfer, we also believe it is plausible for the benefits of NASA programs to begin appearing in the marketplace at these horizons. Although please recognize this does not necessarily mean that NASA technology should immediately serve as regulatory standards at those horizons.

Those of you who do not fit in the categories specified, as co-developers of Technology options should not feel left out at this point. For the purpose of this workshop is to seek information from those who are subjected to aircraft noise and emissions, as well as those responsible for related research and technology. The ECoA Core Team would like all of us to address this basic set of questions at this and the following workshops:

1. What are the impacts of aviation noise and emissions on the environment?
2. How do you believe those impacts may affect the growth of aviation?
3. Must the growth of aviation lead to increased environmental impact?
4. What is the relationship of NASA's noise and emissions goals to aviation's impact on the environment?

Once we have heard your responses to these questions, the ECoA Core Team believes that we will be much better prepared to suggest the technology options which may be necessary to avoid environmental constraints to aviation's growth.

So, for the remainder of the workshop, the Core Team would like to primarily listen to you. Therefore, to avoid having NASA monopolize the agenda and discussion we have asked SAIC to manage the workshop and for Francis X. Murray to be our Chairperson.

Frank is currently Senior Advisor and Director of the Interstate Cooperative Initiative Program to the Global Environment and Technology Foundation. You can ask Frank for information about the foundation. I am impressed that it was the recipient of The Vice President's National Performance Review Award.

Frank has more than 25 years of experience in government, business, non-profit institutions and academia. This includes serving as Staff Director from 1989-95 for the Subcommittee on Energy of the U.S. House of Representatives Committee on Science. He has been a member of the Adjunct Faculty at the Georgetown University's School of Foreign Service for over 20 years, where he has taught a Graduate and Honors Seminar in International Energy and Environmental Issues.

And, he is especially well prepared to participate in our workshop having served from 1974-82 as Director of the National Coal Policy Project; a pioneering effort in environmental dispute resolution that brought together industry and environmental leaders to seek consensus on the policies for using coal in an environmentally and economically acceptable manner.

Frank is now going to explain what we'll be doing for the next 2 1/2 days, and I'm looking forward to what he has planned for us!